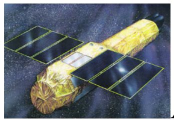ASTRO-E2

INTERFACE CONTROL DOCUMENT

HEASARC-Suzaku (Astro-E2) US processing site

Version 1.2

DATE 20 July 2006

Goddard Space Flight Center
Greenbelt, Maryland

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CHANGE RECORD PAGE (1 of 2)

DOCUMENT TITLE :Interface Control Document HEASARC-Astro-E2 GOF

ISSUE	DATE	PAGES AFFECTED	DESCRIPTION
Version 0.1	Febr 2004	All	First draft. Frame work discussion with Koji Mukai
Version 0.3	April 2004	All	Changes after discussion with Ueda
Version 0.4	April 2005	All	Updates after discussion at ISAS software meeting
Version 0.5	May 2005	All	Updates after discussion with Ken Ebisawa
Version 0.6	June 2005	All	Includes update on filenaming
Version 0.8	June 2005		Clean up
Version 0.9	July 2005	Many	Update the filenames after several email with Japan. Update the database field after Ken and Koji meeting of 20 july
Version 0.91	July 2005	Many	Update file naming after discussion with Japan. This was done just before Ken left. Also add or clarify the database fields
Version 0.92	August 2005	Addition	Add the slew archive layout with their file naming and directory structure
Version 0.93	September 2005	Change	Change the naming convention for the XIS Add keywords after ISAS discussion (Oct 2005)

Version 0.94	October 2005	Change	Several changed in filenamimg and trend (from software meeting and Ken checking e-mail from istrument team and clarification from HXD team)
Version 0.95	October 2005	Change	Updates:Slew,trend (after discussion with Osaki and Ken and XIS team)
Version 0.96	November 2005	Change	Fixed naming for the common files in aux. Add the .log and com files. Fix the name for the slew. Add appendix for the sequence number. Make a note that HK for the xis may be merged by RPT from mk1stfits
Version 0.97	November 2005	Change	Includes several additions part from a summary message from Osaki and previous discussion on the extended HK.
Version 0.98	December 2005	Change	Several additional changes in the trend area data file (as for most of auxil and non X-ray event files)creating an appending just for the example filename for the XRS and specify the directory during the normal operation.
Version 0.99	February 2006	Change	Specify the PROCVER value

Version 1.0 & 1.1	May 2006	Changes	Added PGP specificatio (2.3); PI notification procedure (2.4); start & stop time definition, string syntax for version number (2.5);HXD event background files and XIS spectral background file (3); extension fff for the XIS trend dark and frame (Table section 4);database update(5.1);proposal number (appendix B). Rework example for filenames (appendix C and D).
Version 1.2	July 2006	Changes	HXD add new gti file, lightcurves for different wam in separate extensions ; XIS add new gti file for splitting the different discriminator, arfs maybe generated at later stage; log directory not encrypted; update of the xis database; change the structure of the trend data; change the DTS sending for the XRS com,log and hk

1 Introduction

1.1 Purpose

This document defines the interface requirements between the Astro-E2 US processing site and the High Energy Astrophysics Science Archive Research Center (HEASARC) for the delivery of the Astro-E2 data and the associated database tables. The US processing site responsibility is to run the pipeline to produce calibrated FITS files and derived data products, and to deliver the output of the processing to the archive center. HEASARC is the designated US data archive and is responsible for archiving the Astro-E2 data and providing public access. The data processing occurs also at ISAS in Japan and their outputs are stored in the DARTS archive at ISAS/JAXA. Within this document the acronym APSUS is used to indicate the Astro-E2 processing site in US. NOTE: after the mission was launched it was renamed Suzaku, however within this document the name of the mission is kept to Astro-E2.

This document contains the following information:

- Description of the different data sets and their organization
- Description of filename conventions and file format types (FITS or GIF)
- Description of the associated database tables
- Description of the transfer protocol from the GOF to the HEASARC

This document in located in the astroe2 web area with limited access. Any updates will be reviewed and marked with a different version number.

1.2 Applicable Documents

The requirements contained in this ICD were derived from the following documents:

- Astro-E2 Proposal
- MOU:Astro-E2-HEASARC
- Requirements to archive data at the HEASARC (http://heasarc.gsfc.nasa.giv/docs/heasarc/heasarc_req.html)
- DTS installation guide and manual (SSC-LUX-HB-0004 SSC-LUX-TN-0023)
- Tdat format description http://heasarc.gsfc.nasa.gov/docs/software/dbdocs/tdat.html

2 Data: Overview, Guidelines, and Requirements

2.1 Data processed at the APSUS: Summary of Deliverables

The APSUS deliverables to the HEASARC are the following:

- **The data by observation:** The data are transferred from ISAS (Japan) to the APSUS. The data are organized in observations to which a specific Observation ID is assigned. Each observation includes science, housekeeping and orbit data from all three instruments on board Astro-E2 (HXD, XIS, and XRS) taken during the time interval corresponding to the PI requested exposure. The data transferred from ISAS are the so called *first FITS file*s (FFF. e.g. telemetry converted into FITS standard format). The FFF are created by mk1stfits using the Raw Packet Telemetry (RPT) as input that contains about 2 GB of data. The processing script run at the APSUS converts the FFF data into calibrated event files, so called *second FITS file* (SFF), corresponding to the Level 1 or unfiltered file, applies the data screening generating the Level 2 or cleaned files, and if appropriate extracts the Level 3 or data products such as spectra light curves and others. It also creates the so called *make filter file*. All data files are in FITS format and the software used in the pipeline is included in the standard Astro-E2 software package distributed to the science community. The data files archived include the Level 1, 2 and 3 corresponding to the unfiltered, cleaned and products files, the housekeeping data, orbit and attitude and the make filter file. The FFF are not archived at the HEASARC. There is not loss of information between the FFF and SFF. The difference is that the FFFs have empty columns which are filled by software in the SFF. These columns in the SFF can be repopulated if necessary with the distributed software. Together with FITS products are also archived GIF files showing plots of the FITS data products. Other formats such as ASCII or HTML are used in selected cases. The data by observation are delivered together with a database table.

- **The trend data**: This dataset consists of files that are created as part of the reformatting process into FITS of the telemetry which are not useful for the data analysis but instead are useful to the instrument teams for monitoring the instruments or are files generated during the processing to monitor sets of specific parameters, for example, instrument gain. These data files are not included in the data organized by observation but instead are organized in directories each dedicated to a data type. There may be a few exceptions where files are in the observation directory as well as set aside as trend data. All these data files are in FITS format.
  Data taken during the slews are archived in the trend area and their organization is an exception compared to the other trend data. These data are grouped in directories with a special sequence number and within subdirectories for each instrument since all instruments are taking data during the slew. The slew data will be partially processed.

- **The database tables:** To the data by observation is associated at least one database, e.g. a table containing information for each observation. At the archive site this table is ingested in the database system to allow user to select the data via a database browser. Additional database tables may include the specific instrument configuration tables which contain information on the set-up for each of the instruments during an observation. These tables are generated at the processing site and delivered to the archive.

In this document, *sequence* or *observation number* is used hereafter to identify an observation.

2.2 Database tables and format

The data organized by observation have associated a database table, where each entry records information related to a sequence, e.g., start, stop, observation ID and/or instrument configuration table describing the instrument set-up during an observation. The database tables are ASCII files containing header and data organized as a *tdat* table (see documentation on the *tdat* format). The header lists the definition of the parameters (table fields), their types (if integer or real, etc.) and their units. The data follow the header, where each field is delimited by a special character set to be a pipe (|). An example of a tdat table is given in the Appendix A. All database tables must contain a field key (or a combination of fields) that identifies for each of the database records the associated data files in the archive. If data are organized by directory, this key is the directory name, instead in data organized by file this is the filename. All Astro-E2 databases, described in this document, should also contain a common unique key. This common key relates database table entries that are showed to the users via the related links Browse capability and allow to retrieve more information of a specific observation. For Astro-E2 the unique key is the Observation ID or sequence number.

The database tables have standard format for time and sky position. The times listed in all tables use the ISO convention, e.g., YYYY-MM-DD HH:MM:SS.sss, specified in one field. The HEASARC database system stores the time values internally as MJD. HEASARC will convert the ISO time into the appropriate format before ingesting the table in the database system. Sky positions, Right Ascension and Declination, are given in the table as decimal degrees in the J2000 equinox.

The contents of the database tables for each data set are specified in the sections that follow, however, the parameter names are not given in this document. They will be defined such that the same name is given to parameters with identical information that appear either in the Astro-E2 tables or in existing HEASARC tables.

The database table names are restricted to 10 characters based on the HEASARC database system requirements.

2.3 Data organization and general requirements

This section lists the guideline for file naming, data organization and general requirements on data files.

- Filenames should be defined so as to clearly identify the particular instrument, mode, and/or observation number. Every file should have a unique filename. All filenames are lower case and use the prefix 'ae', the abbreviation for Astro-E2. The filename suffix, whenever possible, should identify the type of data stored in a file (e.g., 'img' for images, 'lc' for light curve, and so on). This document provides the filename convention by defining the “root” name for the files and a syntax for additional specifications. In addition provides specific code for the files identified to be included in an observation. The complete list of filenames is provided as an appendix.

- Each sequence is divided in subdirectories to distinguish different instruments and level of data, limited two layers of depth. The directory structure for the data set by observation is provided in this document.

- All data files must be in FITS format. ASCII and HTML formats may be used to store the parameters file used in the processing and to record the overall processing for a given observation. Plots of the data products may also be provided in GIF, with a few as PS format.

- All data files sent to the archive should be gzip compressed.

- All FITS file should contain the keywords DATASUM and CHECKSUM used to embed a 32-bit 1's complement checksum into each HDU. These keywords are to verify the integrity of the file.

- All FITS file should contain keywords that record the version of the pipeline script used in the processing, the processing and observation date, the number of times the data have been processed, the sequence number, the software and the CALDB version used in the pipeline processing.

- Data by observation will arrive in the archive with the directory structure in place containing data from all instruments that were operational during that observation. If there is the necessity to reprocess the data from a single instrument within an observation, the delivery for that sequence must include all data from all instruments. The database table should be redelivered with the updates due to the new re-processing.

- Step pointing. During the initial phase of the mission the 180 degree slew where achieved by doing a step pointing along the way. These step pointing will be consider as normal observation and process as a proposed observation. Their sequence number is assigned on ground (see Appendix 8).

- Slew data are not included with an observation. These data are archive with the trend data (see section 4.1). It has not been decided if the slew data are proprietary to the team or they belong to the observer or should not any proprietary time.

- Data will arrive in the archive encrypted (see below exceptions), and will be kept encrypted on disk for the proprietary period assigned. They will be accessible from the on-line public HEASARC FTP or via the Web. Data will be decrypted by the archive after the proprietary period ended. ISAS will provide the list of sequences that enter the public domain. Data are encrypted with the Pretty Good Privacy (PGP) algorithm. The actual software used is the GPG version therefore the file extension will be 'gpg' with a 3des cipher compatible with pgp rather than the default CAST5 cypher. During the verification phase data will belong to the Astro-E2 science working group team, however there is no special requirement as far as the data archive. HEASARC uses to decrypt the data a general script available from at

  http://heasarc.gsfc.nasa.gov/docs/cookbook/decrypt.html.

  While the data are encrypted during the propriety period, the database tables are public, e.g. these are ingested in the database system and made available via the Web browser. Data that are not encrypted are: the files in the directory /log under each sequence and the trend data.

- Each sequence contains a FITS file (hereafter catalog file) listing all the files within that sequence. The header of the catalog file contains standard keywords that identify the sequence. This file is used to archive the data and it has to be not encrypted.

Listed here are additional items that should be clarified:

- Some of the data set taken for calibration purposes will be made public during the verification phase when most of the data are still proprietary. These data sets arrive encrypted in the archive and the project will communicate the archive to when made these calibration observations available.

- Data are distributed to the PI electronically. After the data arrives in the archive (expected delay of 1 week after the observation is concluded), a notification is sent to the PI together with the decryption key. The master key list is kept at ISAS, however it has not been yet decided who is responsible for sending the notification or the decryption key. May 2006: The PI is notified by the HEASARC (see section on PI notification).

- The decryption procedure occurs after ISAS provides the list of sequences that entered the public domain together with the decryption key. The mechanism to perform this operation is TBD.

2.4 PI Notification

The US PIs (or US Co-PIs from merged proposals) are notified by the HEASARC that the data are available for download. The PGP key to decrypt the data is included in the notification. The mechanism to generate the notification is the following:

- The processing site generates an ASCII file named ae<obsid>notifypi.txt (see format below), where obsid is the observation number (see definition in the appendix B).

- The processing site generates the ae<obsid>notifypi.txt file for any US or merged US–Japan proposal only when the data are in their proprietary period and therefore encrypted. If during that period the data are reprocessed (and therefore still encrypted) this file should be still generated and will be used to inform the PI that a new version of the data is available.

- The ae<obsid>notifypi.txt file is included with the data files associated to a sequence and sent to the HEASARC via DTS with the key 'aedata'.

- At HEASARC the sequence sent via DTS is scanned for the presence of the *notifypi* file and if present will be moved in a non public area with a filename tagged with the PI name and timestamp.

- During the initial data distribution operation, an operator will be notified and he will check that the data are in the archive and check the *notifypi* file is as expected. If ok the operator will run a script that generates and sends an email to the PI. The email is also cc to a special mail box. After the initial testing the procedure can be made automatic, e.g. the moving the *notifypi* file in a non public area will automatically trigger the script that generates and sends the email to the PI.

The content of the notify file is the following :

- pi_fname= (PI First name)
- pi_lname= (PI Last name)
- pi_email=(PI email)
- name=(Source name)

- ra_nom=(RA Nominal)
- dec_nom=(Dec Nominal)
- obs_start=(Observation start)
- processing_version= (Processing version number)
- obsid=(Observation number or sequence number)
- processing_date=(Date of the data processing)
- pgpkey=(pgp key used to encrypt the data)

2.5 Reprocessing

Data reprocessing may be needed either because of an extensive revision of the processing script, where for example, new capabilities and/or new screening criteria are added and/or new calibration files are available, or because a specific sequence shows data anomalies and the pipeline produces a faulty data set.

The processing script has assigned a version number that clearly distinguishes between an extensive revision of the script and any minor revisions necessary for example to reprocess a faulty sequence. At the HEASARC, Astro-E2 archival data from extensive revision of the processing script are kept in separate directory trees each maintaining a self-similar structure of the archive. The old version will be maintained until all data are re-processed. Archived sequences that show some anomalies (faulty data set) are instead replaced with the (fixed) reprocessed version. Note that all data files belonging to a faulty sequence should be reprocessed and redelivered even if the failure is restricted to only one file or one files for a single instrument.
All FITS files should contain keywords that identify the processing version, the number of times a particular sequence has been processed, the date of the FITS file creation, the observation dates and the observation number. The keywords are:

- PROCVER containing the value of the processing version specified as MM.XX.YY.NN, where MM, XX, YY, and NN are digits whose values are set as follows:
  - MM.XX are assigned to the pipeline processing changes, MM major changes, XX small changes. This is a string.
  - YY is for new version of FTOOLs.
  - NN is for new version of CALDB in the pipeline.

- SEQPNUM containing the number of times a sequence has been processed within a processing version. This is a numerical value with no leading zeros.

- DATE containing the file creation date using the standard FITS convention for dates. This is a string.

- DATE-OBS and DATE-END containing the UTC values of the start and stop of the observation. The date is provided using the standard FITS convention for dates. This is a string. The start and stop times for each sequence is defined as the time when the source is entering or exiting from the PIN FOV. This definition is applied to version of the pipeline higher than 1.0.1.1 (definition start and stop added in May 20006).

- OBS_ID containing the observation number. This is a string.

The HEASARC checks these keywords and takes the appropriate actions before moving the data or the reprocessed data to the final archive location. These keywords should be present in the primary header as well as in the extensions.
In addition the FITS files should contain three keywords to identify the software version and the calibration data used with in the pipeline:

- SOFTVER containing the version of the HEASOFT and Astro-E2 specific software used during the processing. This is as string defined as follows :
  Hea_DDMMMYYYY_Vxxxxx_Suzaku_DDMMMYYYY_Vyyy

  where DD is the day, MMM is the first 3 characters of the month name, YYYYY the year and xxxxx and yyy the version number as advertised in the software distribution.

- CALDBVER containing the version of the calibration index that gives the calibration file list used during the processing of a given observation. This is a string defined as follows:
  hxdYYYYMMDD_xisYYYYMMDD_xrtYYYYMMDD_xrsYYYYMMDD
  where the YYYYMMDD referenced to the latest CALDB version for that instrument.

- MK1STVER containing a string to identify the release version of the 'mkf1stfits' tool that translates the telemetry into the FFF. This is a string defined as follows:
  mk1stfitsYYYYMMDD
  where YYYYMMDD reference to the release of the mk1stfits version used in the processing.

These keywords should be present in all extensions or primary header containing the data.

To allow the file checksum to be independent from the processing site, the Suzaku fits file will contain a new checksum keyword, CHECKSU2 . This is derived by calculating the checksum on a file where keywords processing site specific keywords such as DATE ORIGIN CHECKSUM and others are removed. The value is in the same format of the CHECKSUM keyword.

2.6 Data delivery and transfer protocol

APSUS will transfer the Astro-E2 data to HEASARC using the Data Transfer System (DTS) as data transfer protocol. DTS is a secure system based on the FTP protocol to execute transfers and uses electronic mail for acknowledgments between server and receiver. Each site has its own identifier and each data set its own unique label. The transfer is initiated at the production site (APSUS). At the receiving site (HEASARC) data arrive into a staging area where they are checked for proper file transmission. The unique label allows the start of the appropriate process, via a Perl script named the Data Archive System (DAS) that transfers data to the final HEASARC archive location. List of site identifiers and data unique labels are given in the 'Data transfer' section. DTS is used also to transfer the database tables, associated with each dataset. A unique label is also provided for these tables in the 'Data transfer' section.

Each transferred sequence (for each of the data sets, applied to observation and slew data) should contain all data files that belong to that sequence (e.g., when a sequence enters the archive no more data files can be added later to the sequence already archived.). Each database transmission includes the entire table and not only the last updated records. The database table should precede the data, in other words the database containing the record for a given observation should be sent before the data for that observation. This is to avoid having orphans sequences in the FTP area that can not be searched via the browser.
The data by observation, the database table and trend are expected to arrive at the archive on a daily bases. For a given observation, data are expected one week to arrive after the observation takes place.

3 Data Organized by observation

Each observation is labeled with an Observation number, an 9 digits number, defined as the combination of the proposal category, two digits for AO and the proposal number proposal. Each observation includes housekeeping, orbit, and science data, from the spacecraft and all the instruments on Astro-E2 (HXD, XIS, and XRS). Each observation includes logs and/or relevant information associated with the processing. Data for each instrument obtained by different data modes are stored in separate files. All science and HK files are in FITS. Data products are also provided in GIF. HTML and ASCII files are used for the processing logs. The processing script produces different levels of data for each of the instrument. Data from different RPT can contribute to an observation. While the cleaned event files from all instruments merged data from the different RPTs, the unfiltered files for the XIS and HXD are separated per RPT.
The list of all processed data levels for each of the instruments currently includes:

HXD
Level 1 : unfiltered events (all FITS)
N event files unfiltered for the WELL per RPT N GTI files containing the time intervals for each of the clock rate present in a single RPT N GTI files containing the telemetry saturated frames in a single RPT
I event files unfiltered for the ANTI_WAM per RPT K event files unfiltered for each burst detected per RPT
Level 2: cleaned events (all FITS)
J event files cleaned for the well. These files are obtained by merging the unfiltered files from different RPTs but separating by clock mode and event type (e.g. PIN or GSO). 2 background event files. One is for the PIN and another for the GSO available within a sequence after the task *hxdnxbgen* is released. Mean time IT provides these files via a web. (added May 2006)
Level 3: products (all FITS)
2 source spectra one for the GSO and one for the PIN (clock mode combined) (2 background spectra one for the GSO and one for the PIN) 2 light curve one for the GSO and 1 for the PIN (clock mode combined) 1 light curve for the ANTI_WAM [to be implemented processing version higher 1.0.1.1] Each lightcurve contains 4 different extensions one for each wam subunit. N light curves as many as bursts are detected. Each lightcurve contains four extensions one for each wam subunit. [2 response matrices but if standard maybe in CALDB and therefore not in the archive]
Level 3: products (GIF)
1 GIF containing the plot of the GSO and PIN spectra 1 GIF containing the plot of the GSO and PIN light curves
HK and related files (all FITS)
1 housekeeping file valid for all subsystems of the HXD. This contains 22 extensions each with different information. The HK data coming from different RPT are merged into a single file. 2 gain files for the WELL one of the PIN and one for the GSO (from vs 1.2.2* of the pipeline August 2006). 1 gain file for the WAM

XIS
Level 1 : unfiltered events (all FITS)
N event files for each of the XIS detectors depending on the major sub-modes and RPT. The major mode are defined by the edit mode (5x5 , 3x3, 2x2 and timing). The sub-modes are defined in the microcode file (CALDB file) and differenciate the window size (Field of View) and address, if the burst mode is on or off , its duration and the number of rows combined in the timing mode. Data from one RPT always maps into one unfiltered file per sub-mode. If for example there are two RPT for the XI0 each with two different sub-modes, the total XI0 unfiltered files are 4. If an observation is contained in a single RPT and the sub-mode do not change, there will be in total 4 files one for each instrument. Note: The XIS can set on board different window, grade discriminator and event threshold. The unfiltered files are not split for the different discriminators or threshold but this is taken into account in the cleaned event file. N GTI file one for each RPT to identify the time intervals when different discriminator or threshold were in use for the different sub-mode
Level 2 : cleaned events (all FITS)
J event files for each of the XIS detectors depending on the sub-modes, discriminator and threshold . For a given sub-mode these files are obtained by merging the unfiltered files from different RPTs but similar discriminator and threshold.
Level 3: products (all FITS)
4 light curves: one for each units extracted on the 3 arcmin radius (NOTE: even if there will many sub-mode a light curve will be created for the mode with higher exposure within the observation)
4 spectra: one for each unit extracted in 3 arcmin radius region (see NOTE for light curves) 4 background spectra (extraction is unclear) 4 images 4 arf one for each spectrum (Note: Not generated in the processing version 1.2.2*, may be included in later processing version) [4 rmf one for each spectra (if these are standard in CALDB not need to archive)]
Level 3: products (all GIF)
1 GIF containing the plots for the light curves in the four XIS units 1 GIF containing the plots for the spectra in the four XIS units 1 GIF containing 4 panels with the FOV or the extracted region for each of the XIS units
HK and related files (all FITS)
4 HK files , one for each XIS unit. The single RPT per detector unit are merged in one file

XRS
Level 1 : unfiltered events (all FITS)
1 event unfiltered file containing all data regardless of the filter and the number of RPT that contribute to that observation.
1 GTI file contains many extensions. Each extension report the GTI of a specific filter used during the observation.
Level 2: cleaned events (all FITS)
1 event file cleaned for each of the filter in use
Level 3: products (all FITS)
1 source spectrum using all 32 pixels 1 source light curve using all 32 pixels 1 rmf 1 arf 1 image in sky coordinates 1 image in detector coordinates
Level 3: products (GIF)
1 GIF containing the detector and sky image side by side 1 GIF containing the plot of the light curve 1 GIF containing the plot of the spectrum 1 PS file containing the quick-look output
HK and related files (all FITS)
1 housekeeping files valid for all data containing the hk and dump hk. Information from different RPTs are combined in one file 1 gain file containing four extensions one HI, LOW, MID and HLM events. Information from different RPTs are combined in one file.

OTHER FILES
Auxiliary: (all FITS)
1 attitude file 1 orbit file 1 file containing the timing correction (one extension) and record of operation commands (additional extension). 1 HK file common to all instruments 1 Extended HK file created by the processing. It includes orbit, attitude and information from the common HK file. 1 make filter file common for all instruments. 1 catalog file containing the list of file in the sequence. The archive relies on the presence of this file to move data in the correct location or replace a sequence.
LOGS: HTML and ASCII
1 file containing the parameters associated with the job (ASCII) 1 file containing the parameters for the stage 1 processing (ASCII) 1 file containing the parameters for the stage 0 processing (ASCII) 1 error log (HTML) 1 index log (HTML) 1 job log (HTML) 1 log with file information (HTML) 1 header page (HTML) 1 HXD log file output of the mk1stfits 1 HXD com file with the command used in mk1stfits 4 XIS log files one per XIS unit output of the mk1stfits 4 XIS com files one per XIS unit with the command used in mk1stfits 1 XRS log file output of the mk1stfits 1 XRS file com with the command used in mk1stfits 1 common file log output of the mk1stfits. This file also includes the log obtained by running the RPT/Attitude/Orbit/Tim generation script 1 common file com with the command used in mk1stfits. This file also includes the commands used to run the RPT/Attitude/Orbit/Tim generation script.

For each sequence, the archive expects to find all the file type listed under the HXD XIS and OTHER file. The files listed in the XRS table will not be included in the sequences after the beginning of standard operation (XIS first light started). The data taken with the XRS before

August 8 2005 will be stored in a separate area of the archive and the XRS files that are still produced during normal operation will be instead put in the trend area.

3.1 Directory structure

Science data from all instruments and housekeeping for each sequence are included under a single directory named after the observation number (9 digit number). Under this directory, data are organized into a two level directory structure. The first level of directories divides the data by instrument. These directories are named after the instrument name. At this level, there are also two additional directories: one containing auxiliary data common to all instruments and the other containing all the relevant files that document the processing (e.g., HTML or similar).
Under each instrument directory, a second level of directories divides the data accordingly to their level of processing. The directory structure is:

```
                                        \observation_num
\auxil          \log                    \hxd                    \xis        \xrs
                          \event_uf  \event_cl  \products  \hk
```

where the second layer is shown only for the hxd. NOTE: Approximately one month after the start of the mission, data taken with the XRS were not longer usable because of the problem with the cryogenic liquid (data after the 8 of August 2005). Therefore during normal operation (after XIS first light) there will not be data in the archival sequences taken with the XRS. The XRS will keep sending down HK and non X-ray event data which will be archived as trend data. The directory structure of the sequences for the data in normal operation is therefore the following :

```
                                        \observation_num
\auxil          \log                    \hxd                    \xis
                          \event_uf  \event_cl  \products  \hk
```

The example in the appendix C will not contain therefore XRS file.
The XRS data taken before August 8 will be archived in a separate part of the archive. The directory structure will be similar to what described above but with only xrs data as for:

```
                                  \observation_num
\auxil          \log                    \xrs
                          \event_uf  \event_cl  \products  \hk
```

The subdirectories under xrs are TBC and the sequence number maybe be different from what described in the appendix B. The file naming convention for the XRS as for the other instruments is listed in the next. The example of the XRS filenames is listed in the Appendix D. These filenames will be applied to the XRS data taken before August 8 2005.

3.2 Filename convention

The filename for the science files (event and gti) uses the following convention:

aeXXXXXXXXXiii_N_mmmmmmmm_ll.ext.gz

where

- ae : is the short for Astro-E2
- XXXXXXXXX : is the observation identifier and it is identical to the directory name. This is identical to the sequence number or observation number.
- iii is the instrument specification. This string is as set follows:
  hxd=HXD xrs=XRS xi0=XIS-0 xi1=XIS-1 xi2=XIS-2 xi3=XIS-3

  Files common to all the XIS units have iii set xis.
  [NOTE: The suffix XIS is NOT currently used in any file for the archive 25 Nov-2005]
- N: The original telemetry is divided in RPT files and more than one RPT can contribute to one observation. N ranges from 0-9 where values from 1-9 identify the RPT file number; the value of 0 is used when the science file contains data from different RPT or if there is only one RPT file that contributes to that sequence. Therefore the cleaned event files will always have consistent N value either if they are the merged of several RPT or derived from a single RPT.
- mmmmmmmm is the file identifier. This string can contain up to 8 characters and allows to specify diversities between files from the same instrument. The string does not contain underscored or mathematical symbols.
- ll : is the file level. This is two character string for FITS and GIF files considering the products listed above
- ext : is the file extension.

For the instrument housekeeping files the level is not used.

The filename for the auxiliary files uses the following convention:

aeXXXXXXXXX.ext.gz

.

all these files are in the /aux directory.

The filename for the log files uses the following convention:

aeXXXXXXXXX_mmmmmmmm.ext.gz

where mmmmmmmmm is the file identifier.

or

aeXXXXXXXXXiii_N.ext.gz

where iii is the instrument, N is the RPT number (set to 0 if no RPT distinction is necessary).These files have extension .com and .log.

or

aeXXXXXXXXX.ext.gz

where ext is either .com or .log.

File identifier

Each instrument has a number of minor modes that force to split the data in separate file. A string up to 8 characters is used to distinguish between the sub-modes. Hereafter this string is named *identifier*.

HXD File identifier :

For the HXD the 8 characters identifier differs between the file level. This is because the minor mode splitting occurs at the cleaned event file and additional sub-division are at the product level.

UNFILTERED FILES

- In the unfiltered files for wel and wam, the instrument identifier is 'wel or 'wam', a 3 character string. NOTE: For each of the 'wel' unfiltered files there is an associated GTI file. Each GTI file can contain up to three extensions each corresponding to one of the three clock rates (COARSE,122usec, NORMAL, 61usec and FINE, 31usec). These GTI files are named as the unfiltered event files but the extension is 'gti'.

- In the burst mode the instrument identifiers is set to yyyzz where:
  - yyy is set to bst for burst mode
  - zz is a counter for burst detection. This is a number that ranges from 01,99

GTI

The HXD has two different GTI files with the unfiltered data. Their file identifier are :

- wel, which includes the GTI for the different clock rate
- tel which includes the GTI of the telemetry saturated frames.

FILTERED

- Only for the wel, there are cleaned event files In the clean event file the instrument *identifier* is 5 characters yyyzz, where yyy is set to identify the different main HXD parts (note different from the unfiltered values) and zz allows to include additional specification. The allow yyy values are 'gso', 'pin'
  The allow strings for zz depends on the subsystem specified in the yyy. They are:
  - wel: zz is set to identify the clock rate.. The allow strings are: no (normal clocking), co (coarse clocking), fi (fine clocking). NOTE this is used in the cleaned event files only. Unfiltered events are not split for the clock rate
  - wam: zz is not used
- Event background files for the PIN and GSO use a 6 digits identifier yyyzzz where yyy is set to identify the PIN or GSO and zzz is set to '*nxb*' for not x-ray background. The level suffix *ll* for these files is set to 'cl'.

PRODUCTS

- wel data : the instrument identifier is set to 'wel' 'gso' or 'pin', where 'wel' is used when data from the GSO and PIN units are combined.
- wam data : the instrument identifier is wam
- burst data: the instrument identifier is identical to that used in the unfiltered file.

OTHERS

There are 2 type of files one for the HK and one for the gain where
Their identifier is variable and their name convention are:

- The HK does not have an identifier
- The identifier for the gain file are 'gso' , 'pin, and 'wam' for the gain file of the subunit of the WELL and WAM respectively. The extension is .ghf for gain history file.

Their naming convention are :

aeXXXXXXXXXhxd_0.hk
aeXXXXXXXXXhxd_0_gso.ghf
aeXXXXXXXXXhxd_0_pin.ghf
aeXXXXXXXXXhxd_0_wam.ghf

NOTE : The information from different RPT are combined in a single file.

XIS File identifier :

For the XIS the identifier is the same for event and products and different for HK files.

UNFILTERED, CLEANED, PRODUCTS

- The event identifier uses a three character string to identify the main mode which is followed by a 4 characters that identify the sub-mode and one additional character to identify the configuration for the discriminator and/or threshold. The allow values for the 3 characters string of the main mode are :
  - 'tim' , '5x5' , '3x3' , '2x2'

  For the edit modes (5x5, 3x3, 2x2), the 4 characters string for the sub-mode has the following syntax :
  - nMMM , where n identifies normal window mode and MMM is the microcode
  - bMMM, where b identifies the burst mode and MMM is the microcode.

  For the timing mode (tim) , the 4 characters string for the submode has the following syntax:
  - pMMM, where p identify the psum submode and MMM is the microcode.

  The MMM values present in the submodes represents the on-board microcode mode and is coded as a numerical value running from 000-255. The possible combination of the microcode numbering are recorded in the XIS calibration file represent in CALDB (ae_xis_ucodelst_YYYYMMDD.fits).

  The additional single character is added to distinguish different configuration for the discriminator and or event threshold. This is coded in the file name as follows:
  - Unfiltered file. The character to add is *'z'* to indicate that the files were not separated for different discriminator or event threshold.
  - Cleaned file. The character to add ranges from *a-y*. This character is assigned to always reference to a specific configuration of the discriminator and threshold such that for example *'a'* will always signify the same configuration across all observations. New configuration of the discriminator/threshold will have assigned value of *'b'* , *'c'* etc..

GTI

The XIS GTI files for the unfiltered data contains the times to when the different configuration for the discriminator and threshold are valid. Their file identifier is :

- conf, which includes the GTIs for the different configuration

OTHERS

There is only one type of HK file per XIS units

- HK does not have identifier.

Their naming convention is :

aeXXXXXXXXXxi0_0.hk
aeXXXXXXXXXxi1_0.hk
aeXXXXXXXXXxi2_0.hk
aeXXXXXXXXXxi3_0.hk

XRS File identifier :

For the XRS the identifier is different for events files and HK files.

UNFILTERED FILES

- The XRS unfiltered file contain all the data taken during an observation regardless of the filter or RPT while the cleaned files are separated by filter. The string identifier for the unfiltered and GTI files uses 5 characters and is set to :
  - undef

CLEANED FILES

- The identifier for the XIS cleaned and product files uses 5 characters to id the filter wheel position. The allow values are :
  - fw1on : filter on 1 open
  - fw2oc : filter on 2 open plus calibration source
  - fw3bn: filter on 3 beryllium
  - fw4bc: filter on 4 beryllium plus calibration source
  - fw5nn: filter neutral
  - fw5nc: filter neutral calibration

OTHERS

There are 2 files one for the HK and one for the gain. Their identifier is variable and their name convention are:

- aeXXXXXXXXXxrs_0.hk
- aeXXXXXXXXXxrs_0.ghf

NOTE: The XRS science files will be only produced for when the XRS was operating with the door closed (before August 8). These sequences will be placed in the special area of the archive. During the normal operation only the HK files, log and com from mk1stfits and files containing not X-ray event are produced. All these files are not included with the observations but stored as trend.

HTML and Par *File identifier :*

For the log files the identifiers are :

- lv0 This is a parameter file (stage 0)
- lv1 This is a parameter file (stage 1)
- job This is the parameter file for the archive
- hdpage General html page
- flinfo List of files (html)
- index Index of the html files
- joblog This is a general log of the processing (html)
- errlog This contains the error during the processing (html)

Level

The specific strings used for the level in case of FITS files are the following :

- _uf : unfiltered file
- _cl : cleaned files
- _dt : detector (image)
- _sk : sky (image)
- _sr : file containing only data from the source
- _bg : file containing only data from the background

Note: if one of the instruments includes a background file as product (for example a spectrum), there is a need to distinguish between source and background files. Source and background files are identified by the suffix '_sr' and '_bg' and they are applied to all files from all instruments even if the background is not always available for all instruments. In the example in the Appendix these suffixes are not in use because on the current file listing do not include background files. If the latter are created even at later stage of the mission the filename associated to the products should be changed to include the above suffixes.

The specific strings for the level in case of GIF files are the following strings:

- _im : plot including images
- _lc : plot including light curves

- _pi : plot including spectra

Extension

The specific strings used for file extensions are the following:

- .evt : all event files
- .hk : all HK files
- .lc : light curves
- .img : images
- .gti : GTI files
- .pi (pha) : spectra
- .orb : orbit file
- .att : attitude
- .mkf : filter file
- .cat : observation catalog file
- .tim : timing file
- .html : all HTML logs
- .par : all ASCII parameter files
- .gif : all GIF files
- .log : used in the log files from mk1stfits
- .com : used in the command files from mk1stfits
- .ehk : used for the extended HK
- .ghf : used for the gain history file
- .fits : generic used for trend files
- .fff : **only** used for XIS trend file out of the fits software

A sample directory with the constructed names using the above convention is given in the appendix.

4 Trend data

The following trend data types were identified so far and the listed together with their filename:

TYPE		FILENAME
XIS dark frame		aeXXXXXXXXXxiJ_N_dfiNN.fff (J=0,1,2,3)
where NN is the frame number from 01 to 99.		
XIS dark update	(1)	aeXXXXXXXXXxiJ_N_dunMMM.fff (J=0,1,2,3)
	(2)	aeXXXXXXXXXxiJ_N_dubMMM.fff
where dun and dub are for normal and burst mode respectively and MMM is the microcode used within the file from 000 to 255.		
XIS frame mode	(1)	aeXXXXXXXXXxiJ_N_fnMMMiNN.fff (J=0,1,2,3)
	(2)	aeXXXXXXXXXxiJ_N_fbMMMiNN.fff

(3)	aeXXXXXXXXXxiJ_N_fpMMMiNN.fff
where fn, fb and fp are for normal burst and psum mode respectively and NN is the frame number from 00 to 99 and MMM is the microcode in use within the file from 000 to 255.	
XIS dark init (1)	aeXXXXXXXXXxiJ_N_dinMMM.fff (J=0,1,2,3)
(2)	aeXXXXXXXXXxiJ_N_dibMMM.fff
(3)	aeXXXXXXXXXxiJ_N_dipMMM.fff
where din, dib and dip are for normal, burst and psum modes respectively and MMM is the microcode used within the file.from 000 to 255.	
XIS calibration source event	aeXXXXXXXXXxiJ_0_mmmmmmm_fe.evt (J=0,1,2,3)
For each observation the event associated to the calibration sources are extracted using the status column. The files are generated for each XIS unit and each submode but merged from different RPTs. These files are only for the window submodes that include the calibration sources. In the filename 'mmmmmmm' is set as for the file identifier for the XIS event.	
XIS HK file	aeXXXXXXXXXxiJ_N.hk (J=0,3)
XIS day and night earth	aeXXXXXXXXXxiJ_0_mmmmmmm_de.evt (J=0,1,2,3) aeXXXXXXXXXxiJ_0_mmmmmmm_ne.evt (J=0,1,2,3)
These files are generated for each XIS unit and each submode but merged from different RPTs.	
HXD gain history file	aeXXXXXXXXXhxd_0_gso.ghf (*) aeXXXXXXXXXhxd_0_pin.ghf (*) aeXXXXXXXXXhxd_0_wam.ghf
HXD HK file	aeXXXXXXXXXhxd_0.hk
HXD HK file	aeXXXXXXXXXhxd_0_earth.evt
XRS HK file	aeXXXXXXXXXxrs_0.hk aeXXXXXXXXXxrs_0.com aeXXXXXXXXXxrs_0.log aeXXXXXXXXXxrs_0.evt (**)
Slew data	See section 4.1
auxil : attitude	aeXXXXXXXXX.att
auxil: orbit	aeXXXXXXXXX.orb
auxil: timing correction	aeXXXXXXXXX.tim
auxil: general hk	aeXXXXXXXXX.hk
auxil: make filter file	aeXXXXXXXXX.mkf

These files will be archived in a separate trend area in directories each containing a specific data type. The directory name identifies the type. The slew are archived under the trend area with a special directory structure as described in the following section. NOTE: the RPT files are not archived.

(*) At first the gain files for the GSO and PIN associated with single observations will not be generated in the pipeline but in separate process not included in the pipeline. It is planned to include this process in the v1.2.2.* (starting in August 2006) of the pipeline. The gain file for GSO and PIN stored in CALDB are generated from these sequence dependent gain files.

(**) The XRS event files stored in the trend area contain non X-ray event obtained for sequences generated after the start of the standard operation (XIS first light). These are data taken after August 8 2005.

In the archive the trend area is organized time first in monthly interval. Each month is divided directories one for each instrument and each trend type in dedicated subdirectories under each instrument. The structure is the following :

```
                              /YYYY_MM
    /xis                     /hxd                 /xrs        /misc
/xis0 /xis1 /xis2 /xis3        |                    |           |
  |                       /trend1 /trend2 ….     /trend1 …   /trend1 ….
/trend1 /trend2 ….
```

4.1 Slew data

Each instrument collects data during the slew. These data will be processed but the task 'xiscoord' will not be applied and no screening will be applied to the data. The processing will assigned PI information that allows to derive spectra. The standard screening will not be applied. The files archived are the SFF. *The start and stop time of the slew is TDB, e.g. it is not clear yet what time interval is considered slew and which time interval is considered belonging to the standard observation. A possible definition of the slew is based on when the source is entering or exiting the FOV of the HXD (PIN). [May 2006 update: the start and stop will be implemented as described in the example definition starting with processing version higher than 1.0.1.1]*

The slew data will include data from all instruments and the following files are produced:

- HXD :
  - 1 event for the WAM
  - 1 event file from the WELL
  - N event file for burst mode
  - 1 HK file (similar to the HK file obtained during the observation)
- XIS :
  - 1 event file for each mode and detector units (typically two modes are running during the slew)
  - 1 HK file per detector unit (similar to the HK files obtained during the observation).

The event files are in their SFF version with the limitation described above. To each slew there is also associated an orbit and an attitude file. These data are archived with the specific directory structure each containing data from a single slew and within data are separated by instrument similar to the observation directory structure. The slew directories are tagged by time rather than observation id. This is because to each observation there is always an incoming and outcoming slews which can be viewed as the out coming and incoming slews for different observations. The slews are tagged using the following convention 02yymmddz a 9 digits string as for the normal observation where the yymmdd are the year month and day and the last is a numerical digits to account the case of two or more slews per days (see also appendix). The string that identifies the slew is written in the OBS_ID keyword. The data are organized with the following directory structure:

02yymmddz/
auxil/ hxd/ xis/ xrs/ log/

where the auxil/ directory contain the orbit, the attitude, the general housekeeing files and the file with the listing of all files in the directory (catalog file) and the log/ the processing log associated. The hxd/ xis/ and xrs/ directories contain all files relevant to the hxd , xis and xrs instruments. There will be not further directory structure in place for the slew data.

The files will be named using the same filename convention used for the normal observation.

aeXXXXXXXXXiii_N_mmmmmmmm_ll.ext

where the XXXXXXXXX is set to the 02yymmddz , iii is the instrument name as defined for the files within an observation set, N is the RPT number (it is expected that all the slew data are from a single RPT) , mmmmmmmm is the file identifier. The ‘ll’ is the file level set to ‘uf’ and ‘hk’ for the housekeeping file.

The files in the auxil directory are named as

aeXXXXXXXXX.ext

where XXXXXXXXX and N are defined as above and the extensions are :

- att for the attitude
- orb for the orbit files
- hk general hk file
- cat for the catalog file
- (any others ?)

The files in the log directory have the same names used in the normal observation, with the sequence number appropriated for the slew.

5 Database tables

5.1 Master table: suzamaster

The table associated with the data by observation is named in the HEASARC database system *suzamaster* and contains parameters that are either derived from the processing of the data or from the Observation DataBase (ODB) which master is kept in Japan. The *suzamaster* parameters are:

- Source Name, or target Name of the NFI pointed source. (FITS keyword OBJECT)
- Right Ascension (2000). NFI pointing position as specified in the FITS files. (FITS keyword RA_NOM)
- Declination (2000). NFI pointing position as specified in the FITS files. (FITS keyword DEC_NOM)
- Roll angle in decimal degree. (FITS keyword PA_NOM)
- Start time in UTC given in ISO format Start time of the Observation number. (FITS keyword DATE-OBS)
- Stop time in UTC in ISO format. Stop time of the Observation number. (FITS keyword DATE-END)
- Observation number. This is an 9-digit (this is a string) (FITS keyword OBS_ID)
- Total Observed Exposure. The total exposure is taken from the XIS using the shorter exposure among the XIS units. The exposure is calculated using only the GTI from the cleaned event .
- Total accepted time . Taken from the ODB.
- XIS0 Exposure in seconds on source for the XIS. Calculated from GTI of the cleaned event and considering all modes. Set to 0 if the XIS0 is not operating.
- XIS1 Exposure in seconds on source for the XIS. Calculated from GTI of the cleaned event and considering all modes. Set to 0 if the XIS1 is not operating.
- XIS2 Exposure in seconds on source for the XIS. Calculated from GTI of the cleaned event and considering all modes. Set to 0 if the XIS2 is not operating.
- XIS3 Exposure in seconds on source for the XIS. Calculated from GTI of the cleaned event and considering all modes. Set to 0 if the XIS3 is not operating.
- XIS0 number of modes in used obtained from the processing. Set to 0 if XIS0 is not operating.
- XIS1 number of modes in used obtained from the processing. Set to 0 if the XIS1 is not operating.
- XIS2 number of modes in used obtained from the processing. Set to 0 if the XIS2 is not operating.
- XIS3 number of modes in used obtained from the processing. Set to 0 if the XIS3 is not operating.
- HXD number of sub mode in use obtained from the processing. Set to 0 if the HXD is not operating.
- HXD Exposure in seconds on source for the HXD WELL in coarse. Calculated from GTI of the cleaned event. Set to 0 if the HXD WELL coarse is not operating
- HXD Exposure in seconds on source for the HXD WELL in fine. Calculated from GTI of the cleaned event. Set to 0 if the HXD WELL fast is not operating
- HXD Exposure in seconds on source for the HXD WELL in normal. Calculated from GTI of the cleaned event. Set to 0 if the HXD WELL normal is not operating

- HXD Exposure in seconds on source for the HXD WELL considering all sub-modes. Calculated using the sum of the coarse, normal and fine fields. Set to 0 if the HXD WELL is not operating.
- HXD Exposure in seconds on source for the HXD WAM. Calculated from GTI after processing. Set to 0 if the HXD WAM is not operating
- HXD number of bursts obtained from the processing. Set to 0 if no burst are detected
- Processing status. This field should flag if data have been processed or not yet. The value assigned are PROCESSED, or NOTPROCESSED. Note that if the data are processed the public date, processing date and distribution date should be set.
- Date of processing given ISO format. This corresponds to the date of the latest processing.
- Date of when the data became public given in ISO format. Taken from the ODB
- Date of when the data were first distributed to the user. This field should never change even if the data have been processed more than one. In ISO format.
- Processing version of the script. obtained from the PROCVER FITS keyword.
- The number of times a sequence has been processed within a processing version obtained from the SEQPNUM FITS keyword.
- Software version used to processed the data. Taken from the SOFTVER FITS keyword
- Proposal number. Taken from the ODB.
- Abstract. This is the full abstract. Taken from the ODB.
- Category, Taken from the ODB. String that id the type of object
- Category code. Numerical value for the type of object.
- Priority. Taken from the ODB,
- PI name (two fields first and last name). Taken from the ODB. Last name is set to 'SWG' for all SWG observations taken during the Team guarantee time.
- Co-PI (two fields first and last name). Taken from the ODB.
- Country origin or collaboration of the proposal. This is a string with the following allowed values USA, JAP, EUR, JUS or USJ. Taken from the ODB. NOTE that the designation JAP is given also when for the first set of observation in calibration mode. The observations have a code of 5 in the proposal number.
- Cycle (0 PVtime , 1, 2). The value of 0 is used from the SWG observations.
- TOO, vs non TOO. Taken from the ODB.
- Proposal title . Taken from the ODB,

5.2 Instrument Configuration tables

The instrument configuration tables record in each line a specific mode, window, or filter that has been used during an observation. Currently this table is foreseen only for the XIS and is complementary to the database table, *suzamaster*. It is expected that many records in each of the instrument configuration tables are associated to one record of the *suzamaster* table, because of the mode or sub-mode changes that occur within an observation. The *suzamaster* table is related to the instrument configuration table via the parameter reporting the observation number. The

instrument configuration tables are generated by the APSUS as database tables in a tdat format after the data are processed. The table content listed here has been finalized in July 2006:

- Source name
- Right Ascension (2000) of the pointing position.
- Declination (2000) of the pointing position.
- Roll angle (degree).
- Start time (ISO) for this XIS instrument configuration.
- Stop time (ISO) for this XIS instrument configuration
- Observation_ number. This is a 9-digit number.
- Exposure (taken from the ONTIME)
- Integration time given in seconds. (taken from TIMEDEL *)
- XIS Module.
- Operation mode (taken from DATAMODE keyword)
- Edit mode (taken from EDITMODE keyword)
- Clock mode (taken from CLK_MODE keyword)
- Window option type (taken from WINOPT keyword)
- Window start address (taken from WIN_ST keyword)
- Window size (taken from WIN_SIZ keyword)
- Number of lines summed in the Psum mode (Taken from the PSUM_L keyword)
- Field that record the area and grade discriminator and even threshold. These are several fields populated from the following keywords:
    - ADHST
    - ADHEND
    - ADVST
    - ADVEND
    - DSCINOUT
    - GSDSC
    - EVTLOW
    - EVTUP
    - AREADISC
    - GRADEDIS

- String to identify the specific configuration for the area and grade discriminator and the event threshold (taken from the file name, e.g. a, b, c, etc .,..) .
- Filename. Name of the file containing the data for this interval
- Date of processing given ISO format. This corresponds to the date of the latest processing.
- Processing version of the script. obtained from the PROCVER FITS keyword.
- The number of times a sequence has been processed within a processing version obtained from the SEQPNUM FITS keyword.

6 Data transfer

This section lists the data unique label and the site unique identifier. The DTS command that initiates a data transfer always needs one item from the first and the second table.

6.1 Unique label

A unique label is assigned to each data set and database table. The unique label is used by DTS in 'send' mode to transmit a specific data set. The receiving site initiate the archive procedure based on the value of the label. The table lists the unique label for each of the data sets and database tables:

Data set (or database)	Label
Observation data	aedata
Observation database	aedatadb
XIS instrument configuration	xisconfdb
XRS instrument configuration	xrsconfdb
HXD instrument configuration	hxdconfdb
Trenddata - XIS dark frame	xisdark
Trenddata - XIS dark update	xisdupn xisdupb
Trenddata - XIS dark init	xisdinitn xisdinitp xisdinitb
Trenddata - XIS frame mode	xisframen xisframeb xisframep
Trenddata - XIS cal file	xiscal
Trenddata - XIS day	xisday
Trenddata - XIS night	xisnight
Trenddata - XIS hk	xishk
Trenddata – HXD gain gso & pin	hxdwelgain
Trenddata – HXD gain wam	hxdwamgain
Trenddata – HXD hk	hxdhkgen
Trenddata – HXD earth	hxdearth
Trenddata – XRS hk *	
Trenddata – XRS .log, .com & .hk	xrsxcomlog
Trenddata – XRS noxray .evt	xrsnoxray
Trenddata – slew	aeslew
Trenddata – attitude	aeatt
Trenddata – orbit	aeorb
Trenddata – timing correction	aetim
Trenddata – general hk	aegenhk
Trenddata – mkf	aemkf

* To implement the time division for the trend area in the archive the XRS ASCII files are sent together with the XRS .hk file from which the date is read and used for the archive. The DTS label used to implement this new sent is the previous adopted to sent just the ASCII file.

6.2 Site identifier

Each DTS site has an unique identifier. The identifier is used by DTS in 'send' mode, e.g., when one site sends data to a different site. The table lists the site identifiers for each of the groups that send or receive data:

Institution	Identifier
High Energy Astrophysics Science Archive Research Center	HEASARC2
Astro-E2 GSFC processing site	Astroe

7 Appendix A: Example database table format

This example of database table contains six fields: source name, ra, dec, time of the observation, flux, observation id, unique key. The header is:

field[source_name] = char24 // Source Name
field[ra] = float8:.4f_degree // Right Ascension
field[dec] = float8:.4f_degree // Declination
field[observation_date] = int4_mjd // Observation Date
field[flux] = float8:.8.3f_microJy // average flux
field[sequence_number] = int4:9d // Observation ID
field[unique_key] = int4:9d // Observation ID

For example:

field1 | field2 | field3 |....

where each field is a unique value field1 is the source name, field2 is the RA and field3 is the declination.

8 Appendix B: Sequence number assignment and proposal number

Sequence Number
Each observation is identified by a sequence number. The sequence number is a 9 digit number in the form of
CAAxxxyyz or CSyymmddz
where C is the category code defined as :
0 for non-pointing data
1 for calibration observations
4 for Galactic Compact sources (stars, CVs, X-ray binaries, and isolated neutron stars)
5 for Galactic Diffuse emission
7 for Extragalactic Compact object
8 for Extragalactic Diffuse objects
9 for Gamma-ray Bursts and other non-proposal TOOs

Note : proposed TOO will not have C=9 but rather have the appropriate scientific category (C=4 or C=7, probably)
The meaning for the following digits depends on the value of C if C=0 or C>0.

- C=0 The sequence is identify as 0Syymmddz
  - S is a code that specifies why this is not a normal pointing. The allow values are:
    0 for safe hold
    1 for accidental pointing
    2 for maneuver (slew)
    3 for step pointing
    7 for ground calibration
  - yymmdd is the start date (last two digit year, month and day)
  - z is used to distinguish multiple of such sequences for that day (e.g. multiple slews).

- C>0 . The sequence is identify as CAAxxxyyz
  - AA : is a two digits to identify the AO. 00 is for the SWG time 01 for the A01.
  - xxx: is the target number unique for a given C and AA . Multiple targets within the same proposal will have a different target number. The start value is 1.
  - yy: multiple pointing number (planned multiple observations either specified within the proposal or due to operational needs). The start value is 1.
  - z is used to divide long pointing into multiple sequence for processing purposes. Usually set to 0.

Proposal Number
Each proposal has assigned a number accordingly with the following scheme.
The proposal number is defined as a 6 digits string in the form of CCNxxx where the sigle digits are assigned accordingly with the following scheme:

- CC is the cycle number. This is set to 00 for the SWG time and to 01 for AO1 cycle proposal, 02 for the AO2 as so on.

- N defines the nationality .This is set as follow :

  - N=0 Proposal from Japan
  - N=1 Proposal from USA
  - N=2 Proposal from Europe
  - N=3 Proposal merged with Japanese PI
  - N=4 Proposal merged with US PI
  - N=5 calibration proposal

- xxx is a sequential number set-up by each individual sites accepting proposals**.**

9 Appendix C: Example directory and naming convention

This example shows how the files are named and listed within each directory. For the XIS assumes two RPTs with a 5x5 mode with no burst or window setting; it also assume that the files have one configuration "standard" for the discriminators and thresholds. For the HXD assumes 2 RPT each containing normal and fine clock rates data. This example is for sequence where the background file in addition to the source file is generated as implemented in the pipeline.

NOTE : in the example there are the HXD event background files that are not currently implemented. NOTE all files but those listed in the /log directory will be encrypted.

001122330/log
ae001122330_lv0.par.gz
ae001122330_lv1.par.gz
ae001122330_job.par.gz
ae001122330_hdpage.html.gz
ae001122330_flinfo.html.gz
ae001122330_index.html.gz
ae001122330_joblog.html.gz
ae001122330_errlog.html.gz
ae001122330hxd_0.com.gz
ae001122330hxd_0.log.gz
ae001122330xi0_0.com.gz
ae001122330xi0_0.log.gz
ae001122330xi1_0.com.gz
ae001122330xi1_0.log.gz
ae001122330xi2_0.com.gz
ae001122330xi2_0.log.gz
ae001122330xi3_0.log.gz
ae001122330xi3_0.com.gz
ae001122330.com.gz
ae001122330.log.gz

001122330/auxil
ae001122330.att.gz
ae001122330.orb.gz
ae001122330.tim.gz
ae001122330.hk.gz
ae001122330.mkf.gz
ae001122330.cat.gz
ae001122330.ehk.gz

001122330/xis/event_uf
ae001122330xi0_1_5x5b000z_uf.evt.gz
ae001122330xi1_1_5x5b000z_uf.evt.gz
ae001122330xi2_1_5x5b000z_uf.evt.gz
ae001122330xi3_1_5x5b000z_uf.evt.gz
ae001122330xi0_2_5x5b000z_uf.evt.gz
ae001122330xi1_2_5x5b000z_uf.evt.gz
ae001122330xi2_2_5x5b000z_uf.evt.gz

ae001122330xi3_2_5x5b000z_uf.evt.gz
ae001122330xi0_1_conf_uf.gti.gz
ae001122330xi1_1_conf_uf.gti.gz
ae001122330xi2_1_conf_uf.gti.gz
ae001122330xi3_1_conf_uf.gti.gz
ae001122330xi0_2_conf_uf.gti.gz
ae001122330xi1_2_conf_uf.gti.gz
ae001122330xi2_2_conf_uf.gti.gz
ae001122330xi3_2_conf_uf.gti.gz

001122330/xis/event_cl
ae001122330xi0_0_5x5b000a_cl.evt.gz
ae001122330xi1_0_5x5b000a_cl.evt.gz
ae001122330xi2_0_5x5b000a_cl.evt.gz
ae001122330xi3_0_5x5b000a_cl.evt.gz

001122330/hxd/event_uf/
ae001122330hxd_1_wam_uf.evt.gz
ae001122330hxd_1_wel_uf.evt.gz
ae001122330hxd_1_bst01_uf.evt.gz
ae001122330hxd_2_wam_uf.evt.gz
ae001122330hxd_2_wel_uf.evt.gz
ae001122330hxd_2_bst01_uf.evt.gz
ae001122330hxd_1_wel_uf.gti.gz
ae001122330hxd_1_tel_uf.gti.gz
ae001122330hxd_2_wel_uf.gti.gz
ae001122330hxd_2_tel_uf.gti.gz

001122330/hxd/event_cl
ae001122330hxd_0_pinno_cl.evt.gz
ae001122330hxd_0_gsono_cl.evt.gz
ae001122330hxd_0_pinfi_cl.evt.gz
ae001122330hxd_0_gsofi_cl.evt.gz
ae001122330hxd_gsonxb_cl.evt.gz
ae001122330hxd_pinnxb_cl.evt.gz

01122330/xis/products
ae001122330xis_0_pi.gif.gz
ae001122330xis_0_lc.gif.gz
ae001122330xis_0_im.gif.gz
ae001122330xi3_0_5x5b000.img.gz

ae001122330xi2_0_5x5b000.img.gz
ae001122330xi1_0_5x5b000.img.gz
ae001122330xi0_0_5x5b000.img.gz
ae001122330xi3_0_5x5b000_sr.pi.gz
ae001122330xi2_0_5x5b000_sr.pi.gz
ae001122330xi1_0_5x5b000_sr.pi.gz
ae001122330xi0_0_5x5b000_sr.pi.gz
ae001122330xi3_0_5x5b000_sr.lc.gz
ae001122330xi0_0_5x5b000_sr.lc.gz
ae001122330xi1_0_5x5b000_sr.lc.gz
ae001122330xi2_0_5x5b000_sr.lc.gz
ae001122330xi3_0_5x5b000_bg.pi.gz
ae001122330xi2_0_5x5b000_bg.pi.gz
ae001122330xi1_0_5x5b000_bg.pi.gz
ae001122330xi0_0_5x5b000_bg.pi.gz

001122330/hxd/products
ae001122330hxd_0_wel_lc.gif.gz
ae001122330hxd_0_wel_pi.gif.gz
ae001122330hxd_0_bst01_sr.lc.gz
ae001122330hxd_0_wam.lc.gz
ae001122330hxd_0_gso_sr.lc.gz
ae001122330hxd_0_pin_sr.lc.gz
ae001122330hxd_0_pin_sr.pi.gz
ae001122330hxd_0_gso_sr.pi.gz

001122330/xis/hk
ae001122330xi3_0.hk.gz
ae001122330xi2_0.hk.gz
ae001122330xi1_0.hk.gz
ae001122330xi0_0.hk.gz

001122330/hxd/hk
ae001122330hxd_0_gso.ghf.gz
ae001122330hxd_0_pin.ghf.gz
ae001122330hxd_0_wam.ghf.gz
ae001122330hxd_0.hk.gz

10 Appendix D : Example naming convention only for the XRS

The XRS example filenames are listed separately as these data will be available only for time before Aug 8 2005. It is assumed two RPTs and two filters. NOTE : the files in the auxil directory may not all be available but they are listed for completeness.
Note : as May 2006 there has been not test sequence run.

001122330/log
ae001122330_lv0.par.gz
ae001122330_lv1.par.gz
ae001122330_job.par.gz
ae001122330_hdpage.html.gz
ae001122330_flinfo.html.gz
ae001122330_index.html.gz
ae001122330_joblog.html.gz
ae001122330_errlog.html.gz
ae001122330xrs_0.com.gz

001122330/auxil
ae001122330.att.gz
ae001122330.orb.gz
ae001122330.tim.gz
ae001122330.hk.gz
ae001122330.mkf.gz
ae001122330.cat.gz
ae001122330.ehk.gz

001122330/xrs/event_uf
ae001122330xrs_0_undef_uf.evt.gz
ae001122330xrs_0_undef_uf.evt.gz
ae001122330xrs_0_undef_uf.gti.gz
ae001122330xrs_0_undef_uf.gti.gz

001122330/xrs/event_cl
ae001122330xrs_0_fw3bn_cl.evt.gz
ae001122330xrs_0_fw1on_cl.evt.gz

001122330/xrs/products
ae001122330xrs_0_fw3bn.ps.gz
ae001122330xrs_0_fw3on.ps.gz

ae001122330xrs_0_fw3on_im.gif.gz
ae001122330xrs_0_fw3bn_im.gif.gz
ae001122330xrs_0_fw3on.arf.gz
ae001122330xrs_0_fw3on.rmf.gz
ae001122330xrs_0_fw3bn.rmf.gz
ae001122330xrs_0_fw3bn.arf.gz
ae001122330xrs_0_fw3bn.pi.gz
ae001122330xrs_0_fw3on.pi.gz
ae001122330xrs_0_fw3on.lc.gz
ae001122330xrs_0_fw3bn.lc.gz
ae001122330xrs_0_fw3bn_sk.img.gz
ae001122330xrs_0_fw3bn_dt.img.gz
ae001122330xrs_0_fw1on_dt.img.gz
ae001122330xrs_0_fw1on_sk.img.gz

001122330/xrs/hk
ae001122330xrs_0.ghf.gz
ae001122330xrs_0.hk.gz

11 (Appendix E obsolete June 2006): Example directory and naming convention

This example shows how the files are named and listed within each directory. for the XIS assumes two RPTs with a 5x5 mode with no burst or window setting; for the HXD assumes 2 RPT each containing normal and fine clock rates data. This example is for sequence where the background file in addition to the source file is generated as implemented in the pipeline.
NOTE : in the example there are the HXD event background files that are not currently implemented.
This file listing was for version 1.1 of the ICD.

001122330/log
ae001122330_lv0.par.gz
ae001122330_lv1.par.gz
ae001122330_job.par.gz
ae001122330_hdpage.html.gz
ae001122330_flinfo.html.gz
ae001122330_index.html.gz
ae001122330_joblog.html.gz
ae001122330_errlog.html.gz
ae001122330hxd_0.com.gz

ae001122330hxd_0.log.gz
ae001122330xi0_0.com.gz
ae001122330xi0_0.log.gz
ae001122330xi1_0.com.gz
ae001122330xi1_0.log.gz
ae001122330xi2_0.com.gz
ae001122330xi2_0.log.gz
ae001122330xi3_0.log.gz
ae001122330xi3_0.com.gz
ae001122330.com.gz
ae001122330.log.gz

001122330/auxil
ae001122330.att.gz
ae001122330.orb.gz
ae001122330.tim.gz
ae001122330.hk.gz
ae001122330.mkf.gz
ae001122330.cat.gz
ae001122330.ehk.gz

001122330/xis/event_uf
ae001122330xi0_1_5x5b000_uf.evt.gz
ae001122330xi1_1_5x5b000_uf.evt.gz
ae001122330xi2_1_5x5b000_uf.evt.gz
ae001122330xi3_1_5x5b000_uf.evt.gz
ae001122330xi0_2_5x5b000_uf.evt.gz
ae001122330xi1_2_5x5b000_uf.evt.gz
ae001122330xi2_2_5x5b000_uf.evt.gz
ae001122330xi3_2_5x5b000_uf.evt.gz

001122330/xis/event_cl
ae001122330xi0_0_5x5b000_cl.evt.gz
ae001122330xi1_0_5x5b000_cl.evt.gz
ae001122330xi2_0_5x5b000_cl.evt.gz
ae001122330xi3_0_5x5b000_cl.evt.gz

001122330/hxd/event_uf/
ae001122330hxd_1_wam_uf.evt.gz
ae001122330hxd_1_wel_uf.evt.gz
ae001122330hxd_1_bst01_uf.evt.gz
ae001122330hxd_2_wam_uf.evt.gz

ae001122330hxd_2_wel_uf.evt.gz
ae001122330hxd_2_bst01_uf.evt.gz
ae001122330hxd_1_wel_uf.gti.gz
ae001122330hxd_2_wel_uf.gti.gz

001122330/hxd/event_cl
ae001122330hxd_0_pinno_cl.evt.gz
ae001122330hxd_0_gsono_cl.evt.gz
ae001122330hxd_0_pinfi_cl.evt.gz
ae001122330hxd_0_gsofi_cl.evt.gz
ae001122330hxd_gsonxb_cl.evt.gz
ae001122330hxd_pinnxb_cl.evt.gz

01122330/xis/products
ae001122330xis_0_pi.gif.gz
ae001122330xis_0_lc.gif.gz
ae001122330xis_0_im.gif.gz
ae001122330xi3_0_5x5b000.img.gz
ae001122330xi2_0_5x5b000.img.gz
ae001122330xi1_0_5x5b000.img.gz
ae001122330xi0_0_5x5b000.img.gz
ae001122330xi3_0_5x5b000_sr.pi.gz
ae001122330xi2_0_5x5b000_sr.pi.gz
ae001122330xi1_0_5x5b000_sr.pi.gz
ae001122330xi0_0_5x5b000_sr.pi.gz
ae001122330xi3_0_5x5b000_sr.lc.gz
ae001122330xi0_0_5x5b000_sr.lc.gz
ae001122330xi1_0_5x5b000_sr.lc.gz
ae001122330xi2_0_5x5b000_sr.lc.gz
ae001122330xi3_0_5x5b000_bg.pi.gz
ae001122330xi2_0_5x5b000_bg.pi.gz
ae001122330xi1_0_5x5b000_bg.pi.gz
ae001122330xi0_0_5x5b000_bg.pi.gz

001122330/hxd/products
ae001122330hxd_0_wel_lc.gif.gz
ae001122330hxd_0_wel_pi.gif.gz
ae001122330hxd_0_bst01_sr.lc.gz
ae001122330hxd_0_wam.lc.gz
ae001122330hxd_0_gso_sr.lc.gz
ae001122330hxd_0_pin_sr.lc.gz

ae001122330hxd_0_pin_sr.pi.gz
ae001122330hxd_0_gso_sr.pi.gz

001122330/xis/hk
ae001122330xi3_0.hk.gz
ae001122330xi2_0.hk.gz
ae001122330xi1_0.hk.gz
ae001122330xi0_0.hk.gz

001122330/hxd/hk
ae001122330hxd_0_gso.ghf.gz
ae001122330hxd_0_pin.ghf.gz
ae001122330hxd_0_wam.ghf.gz
ae001122330hxd_0.hk.gz

12 (Appendix F obsolete May 2006): Example directory and naming convention

This section is obsolete since the file products are derived for the source and background for the XIS and therefore the filename has added the suffix 'sr' and 'bg' where appropriate. This section is maintained as record.

This example shows how the files are named and listed within each directory. for the XIS assumes two RPTs with a 5x5 mode with no burst or window setting; for the HXD assumes 2 RPT each containing normal and fine clock rates data.
This file listing was for the Version 1 of the ICD.

001122330/log
ae001122330_lv0.par.gz
ae001122330_lv1.par.gz
ae001122330_job.par.gz
ae001122330_hdpage.html.gz
ae001122330_flinfo.html.gz
ae001122330_index.html.gz
ae001122330_joblog.html.gz
ae001122330_errlog.html.gz
ae001122330hxd_0.com.gz
ae001122330hxd_0.log.gz
ae001122330xi0_0.com.gz
ae001122330xi0_0.log.gz
ae001122330xi1_0.com.gz
ae001122330xi1_0.log.gz

ae001122330xi2_0.com.gz
ae001122330xi2_0.log.gz
ae001122330xi3_0.log.gz
ae001122330xi3_0.com.gz
ae001122330.com.gz
ae001122330.log.gz

001122330/auxil
ae001122330.att.gz
ae001122330.orb.gz
ae001122330.tim.gz
ae001122330.hk.gz
ae001122330.mkf.gz
ae001122330.cat.gz
ae001122330.ehk.gz

001122330/xis/event_uf
ae001122330xi0_1_5x5b000_uf.evt.gz
ae001122330xi1_1_5x5b000_uf.evt.gz
ae001122330xi2_1_5x5b000_uf.evt.gz
ae001122330xi3_1_5x5b000_uf.evt.gz
ae001122330xi0_2_5x5b000_uf.evt.gz
ae001122330xi1_2_5x5b000_uf.evt.gz
ae001122330xi2_2_5x5b000_uf.evt.gz
ae001122330xi3_2_5x5b000_uf.evt.gz

001122330/xis/event_cl
ae001122330xi0_0_5x5b000_cl.evt.gz
ae001122330xi1_0_5x5b000_cl.evt.gz
ae001122330xi2_0_5x5b000_cl.evt.gz
ae001122330xi3_0_5x5b000_cl.evt.gz

001122330/hxd/event_uf/
ae001122330hxd_1_wam_uf.evt.gz
ae001122330hxd_1_wel_uf.evt.gz
ae001122330hxd_1_bst01_uf.evt.gz
ae001122330hxd_2_wam_uf.evt.gz
ae001122330hxd_2_wel_uf.evt.gz
ae001122330hxd_2_bst01_uf.evt.gz
ae001122330hxd_1_wel_uf.gti.gz
ae001122330hxd_2_wel_uf.gti.gz

001122330/hxd/event_cl
ae001122330hxd_0_pinno_cl.evt.gz
ae001122330hxd_0_gsono_cl.evt.gz
ae001122330hxd_0_pinfi_cl.evt.gz
ae001122330hxd_0_gsofi_cl.evt.gz

01122330/xis/products
ae001122330xis_0_pi.gif.gz
ae001122330xis_0_lc.gif.gz
ae001122330xis_0_im.gif.gz
ae001122330xi3_0_5x5b000.img.gz
ae001122330xi2_0_5x5b000.img.gz
ae001122330xi1_0_5x5b000.img.gz
ae001122330xi0_0_5x5b000.img.gz
ae001122330xi3_0_5x5b000.pi.gz
ae001122330xi2_0_5x5b000.pi.gz
ae001122330xi1_0_5x5b000.pi.gz
ae001122330xi0_0_5x5b000.pi.gz
ae001122330xi3_0_5x5b000.lc.gz
ae001122330xi0_0_5x5b000.lc.gz
ae001122330xi1_0_5x5b000.lc.gz
ae001122330xi2_0_5x5b000.lc.gz

001122330/hxd/products
ae001122330hxd_0_wel_lc.gif.gz
ae001122330hxd_0_wel_pi.gif.gz
ae001122330hxd_0_bst01.lc.gz
ae001122330hxd_0_wam.lc.gz
ae001122330hxd_0_gso.lc.gz
ae001122330hxd_0_pin.lc.gz
ae001122330hxd_0_pin.pi.gz
ae001122330hxd_0_gso.pi.gz

001122330/xis/hk
ae001122330xi3_0.hk.gz
ae001122330xi2_0.hk.gz
ae001122330xi1_0.hk.gz
ae001122330xi0_0.hk.gz

001122330/hxd/hk

ae001122330hxd_0_gso.ghf.gz
ae001122330hxd_0_pin.ghf.gz
ae001122330hxd_0_wam.ghf.gz
ae001122330hxd_0.hk.gz